reflected in the investment that is derived from the SCIS model.[1110] They claim that these fill factors are sufficient and that the additional UAFs are unnecessary.[1111] In addition, they assert that, even if the UAFs are appropriate, Verizon improperly determined the UAF for digital trunk ports by including remote switches, which do not support trunks, in its UAF calculation for the digital trunk port fill factor.[1112]

431. In an errata filing, Verizon recalculated its UAF for digital trunk ports excluding *remote switches from its calculation.*[1113]

b. Discussion

432. We adopt Verizon's proposed analog line port fill factor for both analog and digital ports and adopt Verizon's proposed trunk port fill factor. We depart slightly from baseball arbitration, however, in order to require Verizon to correct an error in its calculation of the digital trunk port UAF, as described below.

433. We find that Verizon's proposed analog line port fill factor is reasonable. The proposed fill factor is consistent with, although slightly higher than, Verizon's actual analog line port utilization, and with the line port fill factor that AT&T/WorldCom propose to use in the MSM.[1114] Were we to assume only three to five percent excess line capacity on a switch for administrative, growth, breakage, churn, and capacity limits on busy hour usage, this would produce a fill factor of roughly between 75 and 85 percent, below that proposed by Verizon. In addition, AT&T/WorldCom fail to explain why the fill factor resulting from the SCIS model, exclusive of the UAF, is appropriate. Accordingly, because Verizon's experienced analog line port fill is substantially similar to the fill factor it proposes and because no other viable option was presented by the parties, we adopt Verizon's proposal.[1115]

434. We find that none of the parties substantiates its proposed digital line port fill factor. Although Verizon proposes a digital line port fill factor that is less than its analog line port fill factor, it fails to introduce any evidence substantiating this figure. Verizon provided its actual analog port utilization, but it failed to provide its actual fill for digital line ports. Although Verizon argues that switch capacity is installed before RT capacity, and that, therefore,

---

[1110] AT&T/WorldCom Ex. 24, at 13-14.

[1111] *Id.*

[1112] *Id.* at 13.

[1113] *See* Verizon Ex. 168.

[1114] Verizon Ex. 107, at 196; AT&T/WorldCom Ex. 23, CD-ROM file "VA_C and P Tel Co of VA_VA Direct Filing_WC," worksheet "User Adjustable Inputs," at cell J13.

[1115] Specifically, in its compliance filing, we direct Verizon to use the analog line port fill factor identified on page 195 of its initial cost panel testimony. *See* Verizon Ex. 107P, at 196 (confidential version).

utilization of switch digital line ports is lower than utilization of lines at the DLC RT,[1116] it fails to submit any evidence regarding the degree to which the digital line port fill is lower than the analog port fill. Nor does it provide any evidence of the relative difference between the digital and analog line port fill factor levels. AT&T/WorldCom similarly fail to support their proposal to exclude the UAF from the fill factor. Consequently, in the absence of evidence supporting the use of a different fill factor for digital lines, we adopt Verizon's proposed analog port fill factor as the digital line port fill factor.[1117]

435. We adopt Verizon's proposed digital trunk port fill factor because it is nearly identical to the only relevant record evidence on this point, the digital trunk port fill that Verizon has experienced. AT&T/WorldCom offer no evidence that this fill level is inefficient. We also note that Verizon addressed AT&T/WorldCom's concern that the UAF calculation for digital trunk ports erroneously included remote switches, thus mooting this concern.[1118]

436. In analyzing AT&T/WorldCom's allegation that Verizon miscalculated the digital trunk port UAF and Verizon's response thereto, we have identified an error in the UAF calculation that we require Verizon to correct.[1119] Specifically, Verizon uses incorrect weights to calculate this UAF. The weights Verizon uses to develop the separate weighted average UAFs for digital trunks and digital and analog lines imply a different mix of lines and trunks on 5ESS, DMS-100, DMS-200, and EWSD switches than Verizon uses to develop investment using the SCIS model.[1120] The purpose of weighted averages is to reflect the characteristics of the switches for which costs are being developed. To accomplish this and maintain logical consistency, the weights reflected in the weighted average UAF factors and the weighted average investment must be the same. We therefore require Verizon to develop the separate weighted average UAFs for digital trunks and digital and analog lines based on the mix of lines and trunks on 5ESS, DMS-100, DMS-200, and EWSD switches Verizon is required to use to develop investment using the SCIS model in its compliance filing.

5. Trunk Utilization Level

a. Positions of the Parties

437. In addition to using fill factors in its switching cost calculations, Verizon includes

---

[1116] Verizon Ex. 107, at 195.

[1117] Specifically, in its compliance filing, we direct Verizon to use the analog line port fill factor identified on page 196 of its initial cost panel testimony as the digital line port fill factor. *See* Verizon Ex. 107P, at 196 (confidential version).

[1118] Specifically, in its compliance filing, we direct Verizon to use the digital trunk port fill factor identified on page 196 of its initial cost panel testimony. *See id.*

[1119] This error applies to all of Verizon's UAF calculations, not just its digital trunk port UAF calculation.

[1120] *See* Verizon Ex. 125P, Attach. A (confidential version); Verizon Ex. 168, at 3, 10.

172

assumptions on busy hour utilization levels in its cost studies. Busy hour utilization refers to the amount of peak-period traffic carried on an individual trunk. Verizon develops a busy hour utilization number for each switch in its switching studies.[1121] These numbers are measured in CCS per trunk.

438.   AT&T/WorldCom assert that Verizon's assumed CCS busy hour utilization levels for end-office and tandem trunk ports are too low.[1122] They claim that Verizon confirmed its underutilization of trunks in a discovery response in which Verizon states that it assumed that traffic on tandem trunks associated with two switches excluded from its cost study is carried via existing direct trunks or by other tandem trunks included in the study.[1123] AT&T/WorldCom also argue that Verizon's assumed busy hour trunk utilization levels are inappropriately low because they are substantially below the maximum reasonable utilization assumed in the SCIS model.[1124]

b.   Discussion

439.   We find Verizon's busy hour trunk utilization levels to be reasonable.[1125] We disagree with AT&T/WorldCom's contention that Verizon effectively conceded in discovery that its utilization level is too low. First, AT&T/WorldCom place undue weight on the treatment of traffic carried on the excluded trunks, which represent only a very small percentage of the total tandem trunks and end-office trunks in the Verizon studies.[1126] Second, to the extent that Verizon assumes that traffic on the excluded trunks is absorbed by other existing trunks, the utilization of the existing trunks reflected in its cost study is higher than it otherwise would be.

440.   We also disagree with AT&T/WorldCom's assertion that Verizon's use of trunk port utilizations below the maximum utilization means that trunk utilization is too low. Although AT&T/WorldCom may be correct that the busy hour utilizations used in the Verizon

---

[1121] Verizon Ex. 125P, Attach. B1-B4 (confidential version); Verizon Ex. 161, Attach. H.

[1122] AT&T/WorldCom Ex. 24, at 14.

[1123] *Id.*

[1124] *Id.*

[1125] To the extent that Verizon revises its trunk utilizations due to the other changes that we require Verizon to make to its switching cost studies in its compliance filing, we do not expect such changes to result in lower utilizations than those reflected in Verizon's current switching studies. We therefore direct Verizon to document and explain in its compliance filing the basis for any decrease in utilization levels.

[1126] There are fewer than 10,000 tandem trunks connected to the excluded switches. Verizon assumes that the traffic on these trunks would be handled by direct trunks or by other tandem trunks. AT&T/WorldCom Ex. 24, at 14. In Verizon's cost study, the number of tandem trunks is substantially more than an order of magnitude greater than 10,000, and the number of end-office trunks is considerably greater still. *See* Verizon Ex. 125P, Attach. D (confidential version); Verizon Ex. 161, Attach. H. Thus, the excluded trunks therefore represent a minimal percentage of either the total tandem or the total end-office trunks, even after adjusting the total trunk figures downward to make the excluded and the total trunk numbers comparable.

cost study are below the SCIS model's maximum reasonable utilization,[1127] the maximum level represents the highest, but not the only, or even the most, reasonable level. AT&T/WorldCom, moreover, fail to identify any alternative busy hour CCS per trunk utilization assumptions for use in the SCIS model. Indeed, in their restatement of the Verizon switching cost studies, they use the same busy hour CCS per trunk assumptions that Verizon uses.[1128] AT&T/WorldCom also fail to submit any engineering formulas, tables, or studies to support use of a higher CCS per trunk utilization.

6. EF&I Factor

a. Positions of the Parties

441. The switching EF&I factor represents the ratio of total installed digital switch investment, including investment for material, engineering, furnishing, and installing of a switch, to the material-only investment.[1129] In the Verizon switching cost study, the EF&I factor is applied to forward-looking investment to estimate forward-looking total installed investment.[1130] The EF&I factor is therefore large if the switching vendor discount is large and the discount applies only to material costs.

442. Verizon proposes an EF&I factor based on 1998 investment data for the Verizon-East footprint.[1131] Because Verizon installed a relatively small number of switches in the Verizon-East footprint in 1998,[1132] its proposed EF&I factor reflects a correspondingly large fraction of growth and upgrade investment on which Verizon receives a relatively small discount.[1133] Verizon also showed that, had it based its EF&I factor solely on the new switches

---

[1127] Verizon Ex. 125P, Attach. H (confidential version); Verizon Ex. 161P, Attach. D (confidential version).

[1128] AT&T/WorldCom Ex. 24P, Workpapers (CD-ROM), folder "VA REC&SWITCH," file "Switch Backup," worksheets "EO MOU," "Tdm MOU" (confidential version). We also note that the input value used by AT&T/WorldCom in the MSM for the maximum CCS per trunk utilization is 27.5 CCS per trunk, a value that is considerably lower than maximum value assumed by the SCIS model and that is not inconsistent with the weighted average end-office trunk utilization in Verizon's study. *See* AT&T/WorldCom Ex. 23, CD-ROM file "VA_C and P Tel Co of VA_VA Direct Filing_WC," worksheet "User Adjustable Inputs," at cell J13.

[1129] Verizon Ex. 122, at 201.

[1130] *Id.*

[1131] Verizon Ex. 100P, Vol. XII, Part G-4b at 8 (confidential version); Verizon Ex. 122, at 201.

[1132] Verizon Ex. 219P (Verizon proprietary response to record request no. 35 (requested Nov. 28, 2001)) (confidential version).

[1133] We determined this by examining the number of new switches Verizon-East installed in 1998 and its total material only switch investment for that year. Verizon Ex. 100P, Vol. XII, Part G-4b-VA 2000 Investment Loading Factors.xls, WP_Pg8 (confidential version); Verizon Ex. 219P (confidential version). We then looked at Verizon-East's switch purchases in 2000, for which Verizon provided the purchase price. Verizon Ex. 224 (Verizon response to record request no. 40 (requested Nov. 29, 2001)). Taking the material only price for the most expensive (continued....)

that it installed in 2000 and for which Verizon received a relatively large vendor discount, the factor would have been approximately 58 percent higher than Verizon's actual proposed EF&I factor.[1134]

443. AT&T/WorldCom propose an EF&I factor of 1.27 for Verizon's switching cost study.[1135] Their proposed factor is based on: (1) vendor EF&I investments obtained by running the SCIS model; (2) a telephone company only (*i.e.*, excluding vendor EF&I) EF&I factor developed by Verizon for a 1992 Commission proceeding concerning Open Network Architecture elements; and (3) Virginia sales tax.[1136]

b. Discussion

444. We adopt Verizon's proposed switching EF&I factor.[1137] As we explain above, the vendor discount used to estimate the switch investment to which the EF&I factor applies will be based largely on the new switch discount.[1138] Because the Verizon EF&I factor reflects a relatively large percent of growth and upgrade jobs for which Verizon receives a relatively small discount, but will be applied in the cost study to investments that reflect mostly the relatively large discount Verizon receives for new switches, this factor may be conservative. For example, if Verizon's new year 2000 switches were used to determine the EF&I factor, the factor would be considerably higher. The Verizon factor is preferable, moreover, because it relies on 1998 data, rather than on (in substantial part) decade-old data as AT&T/WorldCom propose. Data of more recent vintage are more appropriate for a forward-looking cost calculation than decade-old data.

(Continued from previous page) ———————————————
switch Verizon-East purchased in 2000 (which is more than three times as large as the average Verizon (Virginia) switch) and multiplying it by the number of switches that Verizon-East installed in 1998 results in a value that is approximately 17 percent of total Verizon-East digital switch investment (material only) for 1998. *See* Verizon Ex. 226P (confidential version). If we start instead with a price twice as high as the most expensive switch Verizon-East purchased in 2000, and multiply it by the number of switches Verizon-East installed in 1998, the result is a value that is only 34 percent of total Verizon-East digital switch investment (material only) for 1998. Thus, even by these conservative measures, it is evident that Verizon-East's switch investment reflects a relatively large proportion of growth and upgrade purchases.

[1134] Verizon Ex. 224.

[1135] AT&T/WorldCom Ex. 12, Attach. 7.

[1136] AT&T/WorldCom Ex. 12, at 120-21, Attach. 2, 7.

[1137] We direct Verizon to use in its compliance filing the EF&I factor identified on page 8, line 7, of its switching investment loading studies. *See* Verizon Ex. 100P, Vol. XII, Part G-4b at 8 (confidential version).

[1138] *See supra* section V(C)(1)(b).

7.   **Right-To-Use Fees**

a.   **Positions of the Parties**

445.   RTU fees are charges paid by a carrier to a switch vendor for software.[1139] RTU fees for a new switch and for upgrades and growth additions are among the long-run costs that an efficient carrier would incur; therefore, they may be reflected in unbundled switching prices. Verizon developed a RTU factor based on Verizon East's actual software expenditures in 1999 and 2000 and Verizon-East's forecasted software expenditures for 2001 and 2002.[1140] Verizon explains that in 1999 an accounting change required carriers to capitalize, rather than to expense, RTU fees.[1141] Verizon further explains that RTU expenditures that in the past had been spread over several years were "brought into" 1999.[1142]

446.   AT&T/WorldCom contend that the 1999 expenditures, which are more than twice as high as those in any other year,[1143] are artificially high due to the accounting change and therefore should be excluded from Verizon's calculations of the RTU fees.[1144]

447.   Verizon also claims that, if we require it to assume a higher percentage of new switches in its cost study than it proposes, then its proposed RTU fee would be too low because it primarily reflects expenditures on software for existing switches rather than new switches. In 1999 and 2000, Verizon installed a relatively small number of new switches, and it claims it is unlikely to install many digital switches going forward.[1145] Verizon claims that the amount of RTU-fees it proposes to recover is conservative because the up-front payment for new switch RTU fees is approximately $2 million per switch.[1146] To support this latter claim, Verizon relies on an AT&T-Lucent switch contract.[1147] Assuming a 12.95 percent cost of capital and a 12-year switch life, a per switch $2 million up-front payment is equivalent to equal annual payments of

---

[1139] Verizon Ex. 107, at 203.

[1140] Verizon Ex. 100P, Vol. XII, Part G-9, VA RTU Factor Study, WP1_Pg1 (confidential version).

[1141] Tr. at 5438-39.

[1142] *Id.*

[1143] *See* Verizon Ex. 100P, Vol. XII, Part G-9, VA RTU Factor Study, WP1_Pg1 (confidential version).

[1144] AT&T/WorldCom Switching Cost Brief at 22-23.

[1145] *See* Verizon Ex. 219P (confidential version).

[1146] *See* Verizon Ex. 122 at 198-99. Because Verizon did not include a revised per switch per year RTU figure in its revised cost study, we calculated this amount based on Verizon's methodology in its earlier filing. *See id.*, Attach. S.

[1147] *Id.* at 198-99, Attach. A.

approximately $337,211 per switch, an amount several times greater than Verizon's proposal.[1148]

b.   Discussion

448.   We agree with AT&T/WorldCom and therefore require Verizon to recalculate its RTU fee excluding the 1999 data. The 1999 data appear anomalous, and Verizon fails to demonstrate that the claimed 1999 fees represent actual cash expenditures solely related to software purchased in that year. We also reject as unsupported by the evidence Verizon's contention that its RTU fee is conservative because new switch up-front RTU fees may be as high as $2 million per new switch.

449.   Verizon fails to address the fundamental question why 1999 expenditures are so much higher than its actual 2000 expenditures and its 2001 and 2002 forecasted expenditures. It offers no rationale explaining whether and for what reasons RTU fees might be sharply higher in a given year, as compared to other years, or otherwise exhibit some pattern that includes such spikes. Nor did Verizon provide any evidence that expenditures during any year for which the rates are set in this proceeding would even approach the 1999 level. The RTU factor and the rates reflecting this factor established for the rate period should reflect the level of expenditures expected during the rate period. Accordingly, we require Verizon to exclude the 1999 data.

450.   We also reject Verizon's claim that its proposed factor is conservative because this claim is not supported by relevant evidence. Verizon's only support for this assertion is its characterization of an AT&T contract with Lucent.[1149] We decline to rely on this contract for several reasons. AT&T's contract reflects the bargaining ability of AT&T, and Verizon likely has a different, perhaps greater, ability. The RTU fee in the AT&T contract also reflects the likely give-and-take inherent in most contract negotiations, and it is not clear what AT&T received in exchange for any concession it might have made relative to RTU fees. Nor is it clear whether what AT&T received as part of the bargain would be of similar value to Verizon. Thus, inferring what Verizon pays for new switch RTU fees based on the AT&T/Lucent contract is inappropriate unless all of the rates, terms, and conditions in the AT&T/Lucent contract are similar to those in a Verizon/Lucent contract (evidence of which is not in the record). In addition, we note that Verizon did not introduce into evidence any of its contracts with Lucent, nor did it propose a RTU fee for new switches based on any of its own data, either of which would seem more probative than the AT&T/Lucent contract. Therefore, Verizon's reliance on the AT&T/Lucent contract fails to demonstrate that its proposed RTU fee is reasonable.

451.   Accordingly, based on the record before us, we require Verizon to recalculate its RTU fees in its compliance filing based on its 2000-2002 data, excluding its 1999 data, as proposed by AT&T/WorldCom. In addition, consistent with the discussion in section III(E)(3), *supra*, Verizon should exclude from its calculations its proposed forward-looking conversion

---

[1148]   *See supra* sections III(C)(3)(d), III(D)(3).

[1149]   Verizon Ex. 122, at 198-99, Attach. A.

factor.

8.   Busy Hour to Annual MOU Ratio

a.   Positions of the Parties

452.   Verizon uses a busy hour to annual MOU ratio (BHAR) to estimate the number of minutes over which to spread its estimate of the usage sensitive switching costs.[1150] Verizon uses the same BHAR to calculate both end-office and tandem switching costs.[1151] It multiplies its estimate of per busy hour capacity MOU[1152] switching costs[1153] by the BHAR to determine per all hour of the day MOU switching costs.[1154] The BHAR equals the busy hour to busy day MOU ratio (BHTD) divided by the number of equivalent busy days in a year.[1155] The BHTD is the fraction of busy day MOU that is in a busy day hour.[1156] Verizon adjusts the tandem switching costs per capacity MOU to reflect billable MOU in its study by multiplying these costs by the ratio of its estimate of total conversation and non-conversation MOU to its estimate of conversation MOU.[1157]

453.   WorldCom asserts that Verizon's MOU calculations, and by implication its BHAR, are flawed.[1158] Because WorldCom proposes recovery of end-office switching costs through a flat rate rather than an MOU charge, it claims that the complexities of this issue need

---

[1150] Verizon Ex. 107, at 199, 201, 207-08.

[1151] *Id.*

[1152] Capacity MOU reflects the total time the switch is in use. These MOU include those for conversation time, *i.e.*, the time that a switch is in use while subscribers are talking to each other, and non-conversation time, *i.e.*, the time required for dialing, ringing, call set-up, and the time associated with calls that are not completed. Non-conversation times are not measured by the switch's billing recordings and therefore cannot be billed. Verizon adjusts the tandem switching costs per capacity MOU to reflect billable MOU in its study. *Id.* at 202, 207-08.

[1153] Verizon develops per busy hour MOU switching costs as follows: It first uses the SCIS model to develop switching investment. It then divides investment by busy hour capacity MOU. Next, Verizon converts the resulting investment per busy hour capacity MOU to total switching costs per busy hour capacity MOU by applying ACFs and investment loading factors. *Id.* at 199-201, 207-08.

[1154] *Id.* at 201, 207-08.

[1155] Verizon Ex. 100P, Vol. VI, Part C-8-1, Busy Hour to Annual Ratio – Back-Up (confidential version).

[1156] *Id*; Verizon Ex. 223 (Verizon response to record request no. 39 (requested Nov. 29, 2001)).

[1157] Verizon Ex. 107, at 207-08; Verizon Ex. 161P, CD-ROM "VZ-VA FCC ARB (Additional Cost Studies)," folder "VA UNBUNDLED REC&SWITCH," file "Back-up_VA MOUR_10_31 Part C-8," worksheets "Inputs," cell L17, and "NCT ADJ" (confidential version).

[1158] *See* WorldCom Ex. 6 (Goldfarb Direct), at 6.

not be resolved if that proposal is adopted.[1159]

b. Discussion

454. We agree with WorldCom that Verizon's proposed BHAR for end-office and tandem switching is flawed. As explained above, the BHAR calculation first requires that Verizon determine the busy day MOU and the number of equivalent busy days in a year. Based on our analysis of the Verizon switching cost studies, we have been unable to verify how Verizon calculated either of these inputs. Therefore, we do not know either the usage characteristics of the busy days that Verizon sampled or how those days compare to an average day. Verizon's failure to clearly document this information renders us unable to determine whether its switching cost study complies with TELRIC principles. In particular, we are unable to determine whether Verizon spreads its switching costs over an appropriate number of days.[1160]

455. We find it unnecessary to correct Verizon's BHAR with regard to end-office switching costs because we agree with WorldCom and find that all end-office switching costs must be recovered through flat-rated port charges, rather than per minute charges. Correcting Verizon's BHAR, therefore, arises only with respect to tandem switching costs, which are recovered through per minute charges.[1161]

456. To test the reasonableness of Verizon's annual MOU estimate, we examined DEM data published in ARMIS.[1162] Although the percentage of total DEMs that are tandem switching DEMs is not reported in ARMIS, we used the data in Verizon's cost studies to determine the percentage of Verizon's tandem busy hour MOU relative to its end-office busy hour MOU. We then applied this percentage to the total reported DEMs from ARMIS to produce an estimate of 2001 tandem switching DEMs. DEMs are billable MOU for Verizon.[1163] Therefore, we

---

[1159] *See id.* at 6-7.

[1160] We note that, in reviewing Verizon-New Jersey's section 271 application, the Commission observed that the number of days that Verizon-New Jersey used in its BHAR "raise[d] serious questions," but it did not resolve this issue because it found that Verizon-New Jersey's non-loop rates were TELRIC-compliant based on a benchmark comparison to New York rates. *Application by Verizon New Jersey, Inc., Bell Atlantic Communications, Inc. (d/b/a Verizon Long Distance), NYNEX Long Distance Company (d/b/a Verizon Enterprise Solutions), Verizon Global Networks Inc., and Verizon Select Services Inc., for Authorization to Provide In-Region InterLATA Services in New Jersey,* WC Docket No. 02-67, Memorandum Opinion and Order, 17 FCC Rcd 12275, 12295, para. 48 (2002) *(New Jersey 271 Order); see also Application by Verizon New England., Verizon Delaware Inc., Bell Atlantic Communications, Inc. (d/b/a Verizon Long Distance), NYNEX Long Distance Company (d/b/a Verizon Enterprise Solutions), Verizon Global Networks Inc., and Verizon Select Services Inc., for Authorization To Provide In-Region, InterLATA Services in New Hampshire and Delaware,* 17 FCC Rcd 18660, 18683, 18703, paras. 37, 70 n.248.

[1161] *See infra* section V(D).

[1162] *See* ARMIS Report No. 43-04: Table I, Separations and Access Table.

[1163] DEMs reflect conversation and non-conversation MOU. There is one originating DEM and one terminating DEM, *i.e.,* two DEMs, associated with each conversation MOU. *See* 47 C.F.R. § 36.125(a)(3) and Glossary. (continued....)

compared the 2001 tandem switching DEMs that we calculated against the billable MOU estimate in Verizon's cost study. This comparison shows that Verizon's billable MOU estimate in its tandem switching study is approximately twenty-four percent lower than the 2001 DEMs estimate for tandem switching.[1164] Accordingly, we find Verizon's number of equivalent annual busy days in the BHAR, and therefore the BHAR, unreasonable.

457.   Because we find that Verizon's BHAR calculation is unreasonable, but neither AT&T nor WorldCom proposed an alternative calculation, we depart from baseball arbitration and require Verizon to use 339 days as the number of equivalent annual busy days in the BHAR. Verizon's proposed tandem switching rate is an average rate that effectively spreads expected costs for the study period (2001-2003) over expected demand at the mid-point of this three-year period.[1165] As we explain above, based on ARMIS DEM data and the tandem to end-office switch busy hour MOU ratio reflected in Verizon's switching cost studies, we calculated the 2001 tandem switching DEMs for Verizon. Spreading Verizon's tandem switching costs over these DEMs, which we adjust to account for our tandem switch MOU growth rate, and accepting Verizon's proposed BHTD, requires that the BHAR be based on 339 equivalent busy days. We thus direct Verizon to use in its compliance filing 339 equivalent busy days in its BHAR calculation.[1166]

D.   Rate Structure

1.   Background

458.   The Commission's general rate structure rules specify that UNE rates be structured consistently with the manner in which the costs of providing them are incurred.[1167] In other words, the basis on which the element is sold to the competitive LEC should reflect the basis on which the cost is incurred by the incumbent LEC. If, for example, the incumbent LEC were to pay the switch manufacturer a per line fee for some of the switch hardware or software,

(Continued from previous page) ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯
Verizon proposes applying an originating switching rate and a terminating switching rate to both intra-switch and inter-switch calls. Verizon Ex. 107, at 201. DEMs are therefore billable MOU for Verizon.

[1164] The billable MOU are lower than the 2001 DEMs even though Verizon assumed an annual tandem switching MOU growth rate between 2001 and 2003. *See* Verizon Ex. 161P, Attach. H, CD-ROM "VZ-VA FCC ARB (Additional Cost Studies)," folder "VA UNBUNDLED REC&SWITCH," file "Back-Up_VAMOUR_10_31 Part C-8," worksheet "Tdm MOU" (confidential version).

[1165] Verizon Ex. 107, at 200-01, 207-08; Verizon Ex. 161P, CD-ROM "VZ-VA FCC ARB (Additional Cost Studies)," folder "VA EXCEL & WORD STUDIES," folder "VA SWITCHING SUPPORT FILES," folder "VA UNBUNDLED REC&SWITCH," file "VAMOURRECIPCOMP0_3l01," worksheet "Assumptions," cell B17 (confidential version). The mid-point for this three-year period is June 30, 2002.

[1166] We also direct Verizon to use in its compliance filing the same BHTD that it used in its original cost study filing. *See* Verizon Ex. 100P, Vol. VI, Part C-8-1, Busy Hour to Annual Ratio – Back-Up (confidential version).

[1167] 47 C.F.R. § 51.507(a); *Local Competition First Report and Order*, 11 FCC Rcd at 15874, para. 743.

then the incumbent LEC should recover these switch costs from the competitive LEC on the same basis. If the incumbent LEC were to recover these costs on a per MOU basis, then this would provide the competitive LEC's subscribers with an uneconomic incentive to reduce usage of this switch hardware or software.

459. The Commission's general rate structure rules also specify that the costs of shared facilities should be recovered in a manner that efficiently apportions them among users, either through usage-sensitive charges or capacity-based flat-rated charges.[1168] That is, these costs should be allocated among subscribers on the basis of their causal responsibilities. The Commission's specific rate structure rule for local switching specifies that costs for this element be recovered through a combination of a flat-rated charge for line ports and one or more flat-rated or per MOU charges for the switching matrix and trunk ports, but it does not specify a particular combination or means for determining the appropriate combination.[1169]

2. Positions of the Parties

460. Verizon proposes to recover the non-traffic-sensitive costs of the switch through a per port charge and the traffic-sensitive costs through a per MOU charge.[1170] According to Verizon, usage affects the costs of providing many of the services associated with switching and thus should be reflected in the rate structure. Verizon states that, when assessing the network demand and purchasing switches and switch upgrades, it is required to forecast switch usage and purchase sufficient capacity to accommodate that usage.[1171] Verizon proposes to recover the following costs on a per MOU basis: "getting started" costs, EPHC costs, RTU software costs, and "shared peak-period costs."[1172]

[1168] 47 C.F.R. § 51.507(c); *Local Competition First Report and Order*, 11 FCC Rcd at 15874, para. 755.

[1169] 47 C.F.R. § 51.509(b); *Local Competition First Report and Order*, 11 FCC Rcd at 15874, para. 757. In reviewing section 271 applications, the Commission has rejected arguments that the TELRIC pricing rules require that at least a certain percentage of shared switching costs must be recovered through flat-rated charges. *See, e.g., Application of Qwest Communications International, Inc. for Authorization to Provide In-Region InterLATA Services in the States of Colorado, Idaho, Iowa, Montana, Nebraska, North Dakota, Utah, Washington, and Wyoming*, WC Docket No. 02-314, Memorandum Opinion and Order, 17 FCC Rcd 26303, 26422, para. 209 (2002) (*Qwest Multistate 271 Order*). In the section 271 context, however, the Commission does not engage in a *de novo* review of a state commission's decision. Rather, the Commission simply determines whether the end result is within the range of rates that a reasonable application of TELRIC principles would produce. As noted above, the Commission's rules give state commissions flexibility to permit recovery of switching matrix and trunk port costs through "one or more flat-rated *or* per minute usage charges." 47 C.F.R. § 51.509(b) (emphasis added).

[1170] Verizon Ex. 115 (West Rebuttal), at 2-3.

[1171] Verizon Ex. 109, at 52-54.

[1172] Verizon Ex. 122, at 191. Shared peak-period costs include non-ISDN line CCS and ISDN CCS, D channel access PPS, PPB channel access PPS, inter-switch PPS, and SS7 link and trunk CCS. AT&T/WorldCom Ex. 12, at 109.

461.   AT&T/WorldCom assert that much of the total cost of a switch is associated with memory and processors and is incurred at the time a switch is placed in operation.[1173] According to AT&T/WorldCom, these "getting started" costs do not vary with usage.[1174] They further assert that the majority of the costs of today's generation of digital switches is driven by ports, rather than usage, and only a very small percentage of the overall equipment in current digital switches is engineered based on peak-period usage.[1175] According to AT&T/WorldCom, based on actual Verizon total switch costs, most costs are non-usage sensitive and should be allocated to the port rather than MOU rate elements.

462.   AT&T and WorldCom diverge slightly with regard to the precise allocation between usage and non-usage sensitive rate elements. AT&T recommends that Verizon continue to assess switching charges using the rate design currently in place, *i.e.*, a separate fixed monthly port charge to recover the non-usage sensitive switch costs as well as a per MOU charge to recover the usage sensitive costs.[1176] Specifically, AT&T agrees with Verizon that shared, peak-period costs should be recovered on a usage sensitive basis.[1177] WorldCom argues that all costs, even the shared, peak-period costs, should be recovered through a flat-rated port charge.[1178]

3.   Discussion

a.   "Getting Started" Costs

463.   We conclude above, for purposes of determining the appropriate switch discount, that the "getting started" cost of the switch is a fixed cost, meaning that it does not vary with the number of ports or the level of usage on the switch.[1179] We find here that the "getting started" costs of the switch should be recovered on a per line port basis. "Getting started" costs are incurred for capacity that is shared among subscribers. Verizon incurs these costs to be ready to provide service upon demand. Given the record evidence that modern switches typically have large amounts of excess central processor and memory capacity,[1180] the usage by any one subscriber or group of subscribers is not expected to press so hard on processor or memory capacity at any one time as to cause call blockage, or a need for additional capacity to avoid such

---

[1173] AT&T/WorldCom Ex. 4, at 7.

[1174] *Id.*

[1175] *Id.*

[1176] AT&T Ex. 4 (Kirchberger Direct), at 13-14.

[1177] *Id.*

[1178] WorldCom Ex. 6, at 7.

[1179] *See supra* section V(C)(1)(b)(i).

[1180] *See supra* para. 391.

blockage. Thus, no one subscriber or group of subscribers is any more or any less causally responsible for the processor or memory capacity costs. Principles of cost causation, therefore, support a per line port cost recovery approach because, more than any other approach, it spreads getting started costs to carriers in a manner that treats equally all subscribers served by a switch.

464. *In addition, charging a per line port price for the central processor and memory* recovers these costs from competitive LECs on a competitively neutral basis, thereby potentially extending to many different subscribers the benefits of competition. The incumbent LEC incurs central processor and memory costs in order to provide service to all of the subscribers served by the switch's line ports. A competitive LEC may serve some of these subscribers and the incumbent LEC may serve some of these subscribers. The incumbent LEC's central processor and memory costs do not vary with respect to whether a subscriber connected to its switch is a high or low volume user, a residential or business user, or a peak-period or off-peak-period user. A competitive LEC faces no advantage or disadvantage in competing against the incumbent LEC if it pays for use of the central processor and memory on a per line port basis. If the incumbent LEC chooses to recover relatively more or less of the central processor and memory cost from high volume business users or low volume residential users, for example, the competitive LEC is able to compete with the incumbent LEC (or another competitive LEC) by doing the same.

465. A per MOU price for the central processor and memory, in contrast to a per line port price, would not recover these costs on a competitively neutral basis. Again, the incumbent LEC's central processor and memory costs do not vary with respect to whether a subscriber connected to its switch is a high or low volume user, a residential or business user, or a peak-period or off-peak-period user. A competitive LEC suffers a competitive disadvantage for high volume users relative to the incumbent LEC if the incumbent LEC recovers central processor and memory costs from the competitive LEC on a per MOU basis. The competitive LEC would pay more to serve the high volume users, while the incumbent LEC could recover the central processor and memory costs, which do not vary with usage, on a per line basis from all of its subscribers, including high volume users. Principles of cost causation do not, therefore, support a per MOU price, because it would recover proportionately more of the "getting started" costs from high usage subscribers than from low usage subscribers.

466. We disagree with Verizon's argument that it "grows" or replaces virtually all of the components of a switch over its life and that, therefore, costs for the central processor are usage sensitive and should be recovered on a per MOU basis.[1181] Verizon fails to show that it would expect to replace the central processor of a modern switch for the specific reason that usage increases over the life of the switch. It identifies three reasons why the processor would be replaced. First, manufacturers continuously upgrade switch software to improve the operational and administrative efficiency of the switch.[1182] These software upgrades at some point require an upgrade to the processor. Second, software is added frequently over time to add

---

[1181] Verizon Ex. 123, at 6-12.

[1182] Tr. at 5435.

the capability to provide new vertical features as they are developed or to accommodate new regulatory mandates such as number portability.[1183] The software added to the switches over time for these reasons at some point requires a processor upgrade. Third, an increase in subscriber usage per line or the number of lines connected to the switch may increase to the point at which the processor must be augmented.[1184]

467. The first two reasons for replacing or upgrading the processor relate to obsolescence, not to the level of subscriber usage over time. Switch obsolescence is accounted for in the useful life of the switch prescribed for estimating the depreciation expense recovered in the switch prices. Showing that the central processor may be replaced due to obsolescence does not demonstrate that processor capacity costs are usage sensitive or should be recovered on that basis. We note that for purposes of determining depreciation expense we have adopted an asset life at the low end of the Commission's safe harbor range: 12 years.[1185] We believe that this relatively short switch life is adequate to reflect the need to upgrade the processor for reasons of obsolescence.[1186]

468. With respect to the frequency with which Verizon would expect to augment the central processor or memory of the switch as usage increases, the only evidence adduced is that processor switch blocking occurred in New Hampshire.[1187] Verizon did not indicate, however, how many switches or subscribers connected to these switches experience blocking, or even whether these switches were modern digital switches. Instead, most of the written and oral testimony and evidence supplied by Verizon and AT&T/WorldCom, as discussed above, indicates that the central processor and memory of a modern switch installed today are unlikely to exhaust as a result of increased subscriber usage.[1188]

b. EPHC Costs

469. EPHC costs relate only to the Lucent 5ESS switch.[1189] The 5ESS switch is based

---

[1183] *Id.*

[1184] *Id.* at 5435-36.

[1185] *See infra* section III(D).

[1186] The useful life for estimating depreciating expense reflects the average life of the various components of a switch. There is no separate useful life for each separate component of the switch, such as the central processor.

[1187] Tr. at 5448.

[1188] Verizon also provided in its surrebuttal testimony examples of various "getting started" components of the switch that it has grown or replaced. Verizon Ex. 122, at 176-78. Verizon explains that the majority of these components were upgrades developed by the switch manufacturer. Again, the fact that Verizon upgrades the "getting started" equipment does not demonstrate that these costs are incurred as a result of increases in subscriber usage. As we discuss above, moreover, Verizon does not provide empirical evidence to quantify the extent to which it has grown or replaced the "getting started" components of the switch. *See supra* section V(C)(1)(b)(i).

[1189] Verizon Ex. 123, at 10. EPHC stands for "equivalent POTS half call."

on a distributed processor architecture. The primary building block of the Lucent 5ESS distributed processor architecture is the switching module.[1190] The common equipment of the switching module consists of a processor complex and equipment designed to terminate line interface and trunk interface equipment.[1191] These common equipment costs are referred to as EPHC costs in the SCIS model output work papers.

470. The parties agree that in general port capacity is reached before processor capacity in the Lucent 5ESS switch modules.[1192] The SCIS model user guide indicates that the switch modules in the Lucent 5ESS switch by design have excess call capacity and that they therefore are expected to be port limited rather than terminal limited.[1193] AT&T/WorldCom argue that there is excess call capacity for every switch in the Verizon switch cost study.[1194] When the number of ports on the switch module reaches capacity, a new switch module is purchased. That is, according to AT&T/WorldCom, the port capacity exhausts before the call capacity of these modules. Verizon states that Lucent has evolved the processor capacities of these modules to stay one step ahead of call volume demand, thereby enabling the modules to avoid processor exhaust.[1195] It did claim, however, that there are circumstances where the processor capacity is reached before the port capacity of the module.[1196]

471. We conclude that EPHC costs should be recovered on a per line port basis. EPHC costs, like "getting started" costs, are incurred for capacity that is shared among subscribers. Verizon incurs these costs to be ready to provide service upon demand. The balance of the record evidence supports a finding that the Lucent 5ESS switch module costs do not vary with respect to usage. Verizon states that there are circumstances when the processor capacity of the module may be increased before its port capacity is reached, or when port demand is limited in order to avoid processor exhaust, thereby suggesting that the EPHC costs vary with usage.[1197] It did not quantify the frequency with which this occurs, however, nor did it provide any other details regarding these situations. Absent such evidence, we cannot conclude that the EPHC costs vary with usage, given the other evidence and testimony in the record. Accordingly, consistent with our analysis of cost causation and competitive neutrality with respect to "getting started" costs, we require that EPHC costs be recovered on a per port basis.

[1190] *Id.*

[1191] *Id.*

[1192] *Id.* at 11; AT&T/WorldCom Ex. 24, at 16-17.

[1193] AT&T/WorldCom Ex. 24, at 17; *see also* Verizon Ex. 123, at 10.

[1194] Tr. at 5446-47.

[1195] Verizon Ex. 123, at 11.

[1196] *Id.* at 12-14.

[1197] *Id.*

c.   RTU Fees

472.   Verizon pays RTU fees to switch vendors for switch software. Verizon states that
it generally does not pay RTU fees on a per MOU or on a per line basis.[1198] Rather, Verizon most
often pays the RTU fees on a per switch basis.[1199] Verizon also states that, in contracts for
Lucent switches, which require software to be loaded into discrete service modules, payment
might be made on the basis of the number of service modules.[1200] Accordingly, we find that RTU
fees should be recovered on a per port basis for reasons similar to those set forth above with
respect to "getting started" costs and EPHC costs.

d.   Shared Peak-Period Costs

473.   The parties agree that shared, peak-period costs – non-ISDN line CCS and ISDN
CCS, D channel access PPS, PPB channel access PPS, inter-switch PPS, and SS7 link and trunk
CCS – *vary with usage.*[1201] They are shared capacity costs. AT&T/WorldCom emphasize, and
Verizon does not dispute, that these costs are incurred for equipment that is engineered and
purchased based on peak-period demand.[1202] The record supports a finding that the equipment
for which these costs are incurred is a limiting resource and that congestion or blocking will
occur as usage increases.[1203]

474.   Peak-period users are causally responsible for shared capacity that is engineered
to satisfy peak-period demand. The need to install additional capacity to avoid call blocking (or
an unacceptably high rate of blocking) by installing more of this equipment results entirely from
usage at its peak. If off-peak usage were to decrease to zero, no costs would be saved
whatsoever. Although the parties all agree that peak-period pricing is correct in principle,[1204] no
party proposes a peak-period rate structure because *such an approach is extremely difficult to*

[1198] Tr. at 5492-93.

[1199] *Id.* In response to a record request, Verizon states that it generally pays for the right to use software on a
"buyout basis" for base generic software. Verizon Ex. 231 (Verizon response to record request no. 47 (requested
Nov. 29, 2001)). We understand the term "buyout basis" as used by Verizon to be equivalent to a per switch or per
module basis. Tr. at 5494. Buyout basis may also refer to payment on the basis of all or a subset of a carrier's
switches. Tr. at 5155.

[1200] Tr. at 5493.

[1201] Verizon Ex. 122, at 195; AT&T/WorldCom Ex. 12, at 109.

[1202] Verizon Ex. 109, at 53; AT&T/WorldCom Ex. 12, at 109.

[1203] Verizon Ex. 109, at 53; AT&T/WorldCom Ex. 12, at 109.

[1204] Tr. at 5475; AT&T/WorldCom Switching Cost Brief at 26.

implement in practice.[1205] Instead, Verizon and AT&T propose recovery of these costs through a per MOU price that is developed by dividing total cost by total annual minutes of use, not peak-period minutes of use, and imposed on all minutes of use.[1206] In contrast, WorldCom proposes a flat per port price for recovery of these shared, peak-period driven costs.[1207]

475. Although neither approach is ideal, we believe that the flat per port price advocated by WorldCom is the better approach. A per MOU price for recovery of these shared, peak-period driven capacity costs, as proposed by Verizon and AT&T, would fail to signal to competitive LECs that these costs vary with subscribers' usage during the peak period in particular. Competitive LECs paying for subscribers' off-peak usage based on a price developed by spreading costs over all minutes of use would pay too much relative to the costs for which they bear causal responsibility. Competitive LECs paying this same price for subscribers' peak-period usage would pay too little. A per MOU rate therefore could result in under-utilization of Verizon's switches during non-peak periods and over-utilization during peak periods.

476. A per MOU price for recovery of shared, peak-period costs also may place the competitive LEC at a competitive disadvantage, as WorldCom points out.[1208] Because Verizon's costs vary with peak-period usage, Verizon may be able to recover shared, peak-period costs from its subscribers by offering a per MOU price for peak-period minutes of use and a zero price for unlimited off-peak minutes of use. A competitive LEC may not be able to recover its costs by offering the same peak/off-peak prices that Verizon offers, however, because the competitive LEC's costs would reflect how Verizon bills the competitive LEC and not how Verizon actually incurs the cost.

477. A flat per port price for recovery of these shared, peak-period driven costs, as proposed by WorldCom, avoids the competitive concerns that arise with a per MOU charge. A flat per port price for recovery of shared, peak-period costs also avoids problems in Verizon's switch cost study associated with estimating the minutes of use over which to spread its switching costs. The Verizon study uses a ratio of busy hour minutes of use to annual minutes of minutes of use (BHAR ratio) to convert its estimate of switch costs per busy hour to switch costs per annual minutes of use. As explained above, the BHAR ratio that Verizon proposes is flawed because it significantly underestimates the annual minutes of use over which the switching costs are spread.[1209] By spreading switching costs over line ports, rather than annual minutes of use,

---

[1205] For example, different switches would have different peak periods. Peak-period pricing would require either different prices for different switches based on the probabilities of peak-period usage for each switch, or developing some meaningful way to reflect peak-period usage probabilities in statewide or UNE zone average rates.

[1206] AT&T Ex. 4, at 14; Verizon Ex. 115, at 2-3.

[1207] WorldCom Ex. 6, at 5.

[1208] *Id.* at 5-6.

[1209] *See supra* section V(C)(8); *see also New Jersey 271 Order*, 17 FCC Rcd at 12295, para. 48 (noting "serious questions" regarding Verizon's assumptions underlying its busy hour determinations).

this problem is avoided.

478. Verizon argues that flat-rated recovery of costs that vary with usage would result in low volume subscribers subsidizing high volume subscribers.[1210] We have no basis on the record to conclude that Verizon is correct. We do not know the extent to which low or high volume subscribers' usage occurs during the peak period or non-peak periods, and, therefore, we do not know whether a flat per port price or a per MOU price imposed on all subscriber minutes is more likely to recover these shared, peak-period driven costs from subscribers in proportion to their peak-period usage. Thus we cannot assess the extent to which low volume users would be subsidizing high volume users, or vice versa, under either rate structure. We acknowledge that the approach we adopt is imperfect in the sense that it would fail to signal to competitive LECs the costs that Verizon would incur if subscriber usage were to increase, which could result in over-utilization of Verizon's switches, and blocked calls, during peak periods. Given that Verizon already offers flat-rated calling to its own end-users,[1211] however, we do not believe that offering similar pricing to competitive LECs would increase the likelihood of blocked calls due to increased calling by competitive LEC customers.

479. AT&T/WorldCom suggest that we adopt different results for the two different agreements before us.[1212] AT&T and Verizon agree that shared, peak-period costs should be recovered through a per MOU charge on all usage. As noted above, however, WorldCom argues, and we agree, that these costs should be recovered on a flat, per port basis. Thus, consistent with "baseball arbitration," we could adopt a per MOU charge for the AT&T-Verizon agreement and a flat, per port charge for the WorldCom-Verizon agreement.

480. Verizon argues, however, that prescribing two different rate structures raises the possibility that a competitive LEC paying the flat, per port rate would target high volume users, while a competitive LEC paying the combined flat, per port and per MOU rates would target low volume users,[1213] which might preclude Verizon from recovering all of its shared costs.[1214] Verizon is correct in theory. The per port price is an average price and the per MOU price is an average price. A carrier serving low volume subscribers would pay Verizon an amount that is less than the overall cost per subscriber, if it pays for the shared peak-period driven capacity costs on a per MOU basis; a carrier serving high volume subscribers would pay Verizon an amount equal to the overall cost per subscriber, if it pays for the shared peak-period driven capacity costs on a per port basis. Verizon would not recover all of its shared costs under this scenario if it were to lose enough high volume and low volume subscribers to these competitive

---

[1210] Verizon Switching Cost Brief at 23.

[1211] AT&T/WorldCom Switching Cost Brief at 26.

[1212] *See* AT&T/WorldCom Switching Cost Brief at 27.

[1213] Tr. at 5474-75.

[1214] *Id.*

LECs and is unable to recover a disproportionate share of these costs from its own subscribers.

481. AT&T/WorldCom respond that the risk of under-recovery that Verizon would face if it offers two different rate structures is no different from the risk it currently faces by offering its residential subscribers a choice between flat-rated or message unit pricing plans.[1215] They also note that a competitive LEC paying the per MOU price for unbundled switching bears the risk of paying peak-period driven capacity costs for off-peak usage , while Verizon does not incur these costs in off-peak periods or face that risk.[1216]

482. We agree with Verizon that a requirement to offer unbundled switching on both a flat-rated, per port basis and a combined flat-rated, per port and per MOU basis creates the potential for under-recovery of switching costs. AT&T/WorldCom's analogy to retail rates is not convincing. The Commonwealth of Virginia has jurisdiction over the risk of under-recovery that Verizon faces by offering its own residential subscribers flat-rated and message unit pricing options. The matter before the Bureau is the risk of under-recovery that Verizon would face if required to offer unbundled switching on both a flat-rated, per port basis and a combined flat-rated, per port and per MOU basis to wholesale customers. AT&T/WorldCom allege that the relative risk faced by Verizon due to its retail flat-rated and message unit pricing options is similar to the risk associated with offering competitive LECs both flat-rated, per port and per MOU pricing options, but they did not quantify this risk. Nor could we know, based on the record, whether this is an acceptable level of risk for Verizon to bear when selling unbundled switching to competitors. We therefore reject AT&T/WorldCom's arguments that in this proceeding we should require Verizon to offer unbundled switching on both a flat-rated, per port basis and a combined flat-rated, per port and per MOU basis.[1217]

483. Based on the potential for under-recovery that might exist if we require two different rate structures, we find that the shared, peak-period costs should be recovered on a flat, per port basis in both agreements. As explained above, this approach avoids the competitive disadvantages associated with use of a per MOU price imposed on all usage and it avoids the problems involved with estimating the minutes of use over which to spread an estimate of switching costs.

[1215] *Id.* at 5478.

[1216] *Id.* at 5479.

[1217] We recognize that the rates we establish in this arbitration proceeding reflect a different mix of port charges and usage charges than the rates contained in Verizon's agreements with other competitive LECs in Virginia. Because this would be true even if we allowed Verizon to recover the shared, peak period costs on a per MOU basis, we do not believe the existence of these other agreements is reason not to permit consistency between the two agreements at issue here.

E.   Reciprocal Compensation

1.   Background

484.   Pursuant to section 251(b)(5) of the Act, incumbent LECs are obligated to "establish reciprocal compensation arrangements for the transport and termination of telecommunications."[1218] In the *Local Competition First Report and Order*, the Commission decided that TELRIC pricing was appropriate for reciprocal compensation under section 251(b)(5).[1219]

485.   Verizon proposes two separate rate elements for reciprocal compensation: (1) "Meet-Point A End Office MOU," and (2) "Meet-Point B Tandem MOU." Meet Point A End Office MOU applies to traffic originating with a competitive LEC end-user and terminating to a Verizon end-user for which Verzion provides end-office switching, and it is designed to recover costs for end-office switching and a shared end-office trunk port.[1220] Meet-Point B Tandem MOU applies to traffic originating with a competitive LEC end-user and terminating to a Verizon end-user for which Verizon provides end-office switching, tandem switching, and shared transport.[1221] The rate for this element is designed to recover costs for end-office switching, a shared end-office trunk port, tandem switching, two shared tandem trunk ports, and shared transport.[1222]

486.   Verizon states that it developed the end-office switch usage cost for reciprocal compensation by determining the costs associated with basic usage (service without optional features). Verizon excludes, however, the "getting started" investments identified by the SCIS model and the RTU fees.[1223] According to.Verizon, these costs are not affected by the additional

---

[1218] 47 U.S.C. § 251(b)(5). For purposes of reciprocal compensation, "transport," under the rules now in effect, consists of "transmission and any necessary tandem switching of telecommunications traffic subject to section 251(b)(5) of the Act from the interconnection point between the two carriers to the terminating carrier's end office switch that directly serves the called party." 47 C.F.R. § 51.701(c). "Termination" is "the switching of telecommunications traffic at the terminating carrier's end office switch, or equivalent facility, and delivery of such traffic to the called party's premises." 47 C.F.R. § 51.507(d).

[1219] *Local Competition First Report and Order*, 11 FCC Rcd at 16023, para. 1054. The Commission subsequently established a set of rate caps that govern the exchange of traffic delivered to internet service providers, subject to certain conditions. *Intercarrier Compensation for ISP-Bound Traffic*, CC Docket No. 96-98, Order on Remand and Report and Order, 16 FCC Rcd 9161 (2001), *remanded sub nom. WorldCom, Inc. v. FCC*, 288 F.3d 429 (D.C. Cir. 2002). We leave it to the parties to determine under their interconnection agreements under what circumstances the rates we establish in this case will apply. *See Non-Cost Arbitration Order*, 17 FCC Rcd at 27173, para. 280.

[1220] Verizon Ex. 100P, Vol. VI, Part C-10, Supporting Information (confidential version).

[1221] *Id.*

[1222] *Id.*

[1223] Verizon Ex. 107, at 204

usage to which the reciprocal compensation rates apply, and therefore they should not be included as part of reciprocal compensation pursuant to sections 251(b)(5) and 252(d)(2)(A) of the Act.[1224] Verizon proposed a separate tandem office switch usage cost for reciprocal compensation that also excludes the "getting started" investments and RTU fees.[1225]

487.   According to AT&T/WorldCom, Verizon's argument that "getting started" costs and RTU fees do not vary with usage applies equally to UNE switching and to the termination of traffic that is subject to reciprocal compensation.[1226] Accordingly, AT&T/WorldCom argue that we should adopt their proposal to recover the "getting started" cost of a switch and the associated RTU fees on a flat per port basis. In the alternative, AT&T/WorldCom argue that, if we do not adopt this proposal, these costs should be more fairly apportioned to all traffic, including traffic subject to reciprocal compensation, and not just to UNE switch usage rates.[1227] They argue that Verizon's proposal to include these costs in UNE switching rates but not in reciprocal compensation rates is inconsistent with its acknowledgement that "on a strictly technical basis, the switch does not treat either type of terminating call differently.[1228]

2.   Discussion

488.   We find that end-office switch and shared end-office trunk port costs should be excluded from both Meet-Point A and Meet-Point B reciprocal compensation prices, consistent with our decision to adopt a flat, per port price for unbundled end-office switching. The general formula for developing a UNE price under TELRIC is to divide total cost by total demand. If we prescribe a flat, per line port price for unbundled end-office switching, including shared end-office trunk ports, the switch price equals total switch costs divided by total line ports. The price derived from this formula, if imposed on both competitive LECs that purchase the incumbent LEC's line ports and the incumbent LEC's end-users, would fully compensate the incumbent LEC for all of its switch costs. Competitive LECs that pay a flat, per line port price for unbundled end-office switching should not, therefore, pay the incumbent LEC any additional amount for use of end-office switching to terminate reciprocal compensation traffic.

489.   We also find that "getting started" costs and RTU fees associated with tandem switches should be recovered in Meet-Point B reciprocal compensation prices, not just UNE tandem usage prices. Switch engineering requirements and therefore costs do not vary according to whether an incumbent LEC switch is terminating UNE or reciprocal compensation traffic.

[1224] Verizon Ex. 122, at 194.

[1225] Verizon Ex. 107, at 204.

[1226] *Id.* at 117.

[1227] *Id.* at 118. AT&T/WorldCom do not distinguish between end-office and tandem switching for purposes of this argument.

[1228] AT&T/WorldCom Ex. 12, at 116.

191

Verizon conceded that "from a cost perspective" a "terminating minute is a terminating minute" with regard to an end-office switch.[1229] There is no reason that a similar conclusion would not apply to tandem switch usage. Moreover, the Commission has adopted the same TELRIC pricing standard for UNEs and for reciprocal compensation,[1230] but Verizon admits that it applied different pricing standards in developing these rates.[1231] Tandem switch costs that are recovered in prices applying to reciprocal compensation traffic therefore should be equal to tandem switch costs that are recovered in prices applying to UNE traffic.

F.   Features

1.   Background

490.   Costs for the numerous vertical features that do not require specific, unique hardware are included in Verizon's proposed per port and per MOU switch prices.[1232] Verizon proposes "port additives" or per port prices to recover costs for 34 vertical features that have specific, unique hardware.[1233] These charges would apply only to lines that use the feature.[1234] Verizon uses the SCIS/IN module to develop the additional hardware costs associated with these vertical features. SCIS/IN bases these additional costs on vendor prices for this specific, unique hardware.[1235] The user enters as an input into SCIS/IN the price discount that the carrier receives on hardware purchases from the vendor, as well as a number of inputs relating to subscriber usage.[1236]

491.   AT&T/WorldCom do not propose separate prices for any vertical features if we adopt the MSM to develop switch costs.[1237] The MSM does not develop separate costs for any vertical features. According to AT&T/WorldCom, the composite prices derived from the MSM

[1229] Tr. at 5488-89; *see also id.* at 5501-02.

[1230] *Local Competition First Report and Order*, 11 FCC Rcd at 16023, para. 1054.

[1231] Tr. at 5505.

[1232] Verizon Ex. 107, at 181-182.

[1233] *Id.* at 182.

[1234] Tr. at 5520-21.

[1235] Verizon Ex. 107, at 205.

[1236] For example, to develop the distinctive ringing/call waiting (DRCW) feature offered in connection with Centrex service, the user must specify the number of: (1) busy hour (BH) screen line editing (SLE) sessions per line; (2) entries added per BH SLE session; (3) entries deleted per BH SLE session; (4) holding time seconds per session; (5) BH DRCW calls per line; and (6) SLE lines per central office.

[1237] AT&T/WorldCom Switching Cost Brief at 8.

recover all switch costs, including vertical feature costs.[1238] If we adopt the SCIS model, AT&T/WorldCom argue that Verizon fails to provide support for its input values and that this failure is grounds for disallowing these separate vertical feature prices entirely.[1239] Alternatively, AT&T/WorldCom re-state the Verizon vertical features cost study using different vendor discounts and different inputs for certain features.[1240] AT&T/WorldCom emphasize that their ability to evaluate fully Verizon's proposed inputs is limited by Verizon's failure to document how it developed these inputs.[1241]

2.   Discussion

492.   We reject Verizon's proposed separate vertical feature prices. Verizon identifies values for the inputs its uses in the SCIS/IN module, but it does not provide any justification for these input values. Verizon defends these input values against AT&T/WorldCom's criticism by arguing that they are based on the judgment of a product manager who has over 25 years of experience.[1242] It fails, however, to document or explain any of the data, assumptions, methodologies, calculations, formulas, or workpapers that might have been used by this product manager to develop these inputs.[1243]

493.   Although Verizon has not met its burden of proof with respect to features cost inputs,[1244] AT&T/WorldCom do not dispute that there are in fact costs associated with these features, nor do they dispute that these costs are not recovered elsewhere. Accordingly, rather than adopt AT&T/WorldCom's suggestion that we disallow these costs entirely, we will instead require Verizon to re-run the SCIS/IN with the inputs proposed in AT&T/WorldCom's restatement and the vendor discounts we adopt in section V(C)(1)(b) above.[1245] We note that there is a need for consistency between the line growth assumptions we make to calculate the weighted average discount, the sizing of the switch in estimating the vertical feature investment,

---

[1238] *Id.*

[1239] AT&T/WorldCom Ex. 12, at 105.

[1240] *Id.*

[1241] *Id.* at 104-05.

[1242] Verizon Ex. 122, at 190-91.

[1243] *See* AT&T/WorldCom Ex. 12, at 105.

[1244] 47 C.F.R. § 51.505(e).

[1245] *See supra* section V(C)(1)(b). In particular, to the extent that the additional investment includes "getting started" investment, we direct Verizon to use the discount we adopt for "getting started" investment, *see supra* section V(C)(1)(b)(i); to the extent that the additional investment includes other end-office switch investment, we direct Verizon to use the discount we adopt for that investment, *see supra* section V(C)(1)(b)(ii)(a); to the extent that the additional investment includes end-office switch trunk port or SS7 link investment, we direct Verizon to use the discount we adopt for that investment, *see supra* section V(C)(1)(b)(iii).

and the number of line ports over which to spread the investment. We therefore require that the investment calculated using the SCIS/IN module should reflect the specific, unique hardware to provide vertical features for a switch sized to accommodate the present value of the investments required for the number of lines installed on the switch over a 12-year period, assuming a 2.5 percent annual rate of line growth, and that these lines are installed every two years. We also require that the line port demand over which to spread this vertical feature investment reflect the present value of the investments required for the number of line ports demanded over a 12-year period, and for which the associated end-user buys these vertical features, assuming a 2.5 percent annual rate of line growth, and that line demand grows every year.

VI.   INTEROFFICE TRANSPORT

494.   Interoffice transport refers to the transmission facilities used to carry traffic between incumbent LEC or competitive LEC wire centers or switches. There are two primary forms of local interoffice transport: (1) dedicated transport, and (2) common or shared transport.[1246] Essentially, dedicated transport is interoffice transport that is dedicated to a particular carrier and common transport is interoffice transport that is shared by more than one carrier.[1247]

495.   The Commission's TELRIC pricing rules apply to the rates charged when dedicated and common transport are offered as UNEs.[1248] The *Local Competition First Report and Order* and the Commission's rules, however, provide only general guidance on the proper manner for incumbent LECs to recover dedicated transport and common transport costs. The Commission's rules require that dedicated transport costs "be recovered through flat-rated charges."[1249] An incumbent LEC may recover common transport costs "through usage-sensitive charges, or in another manner consistent with the manner that the incumbent LEC incurs those costs."[1250]

496.   In its universal service orders, the Commission provided additional guidance for determining an incumbent LEC's forward-looking transport costs. In its analysis of the common transport cost models in the *Platform Order*, the Commission found that "models should accommodate an interoffice network that is capable of connecting switches designated as hosts and remotes in a way that is compatible with the capabilities of equipment and technology that

---

[1246] Because the parties generally use the term common transport rather than shared transport, we do so as well in this order. *See, e.g.,* Verizon Ex. 100, Vol. VI, Part C-9, section 1.1 (Service Description) ("Common Transport is one of the Unbundled Elements available to CLECs.").

[1247] Rates for dark fiber transport and for entrance facilities are discussed *infra* in section IX.

[1248] 47 C.F.R. §§ 51.501 (TELRIC pricing rules apply to UNEs).

[1249] 47 C.F.R. §§ 51.507(b), 51.509(c); *see also Local Competition First Report and Order,* 11 FCC Rcd at 15874, para. 744.

[1250] 47 C.F.R. § 51.509(d); *see* 47 C.F.R. § 51.507(c).

are available today and are consistent with current engineering practices."[1251] The Commission concluded that both models presented at the time – the BCPM and HAI 5.0 – "assume the least-cost, most-efficient and reasonable technology to provide the supported [universal] services. . . [and both] interconnect switching facilities with state-of-the-art SONET rings."[1252] The Commission further concluded that the HAI model better satisfied the forward-looking pricing methodology than the BCPM model did. Specifically, the Commission found that the HAI model (1) was less complex than the BCPM, while still providing sufficient detail to determine accurately common transport costs, and (2) relied on data computations and assumptions that were more readily available for review and comment.[1253] The Commission then incorporated the HAI model common transport module into the SM.[1254] Notably, however, because the Commission was determining universal service costs, it did not address dedicated transport costs and cost models.

A. Cost Models

1. Positions of the Parties

497. Verizon submitted cost studies that generate rates for both common transport and dedicated transport.[1255] To generate rates for dedicated transport, Verizon determines the fixed, monthly investment costs and the per mile investment costs, assuming the use of SONET technology (including SONET add/drop multiplexers (ADMs) and digital cross-connects (DCSs)), and assuming a "reasonable" utilization rate (*i.e.*, fill factor).[1256] Verizon uses negotiated prices from its most recent vintage vendor contracts then available (*i.e.*, 1998 contracts) to determine the material prices, and applies loading factors, including the EF&I factor, and land and building factors to generate total installed investment.[1257] The VRUC system

---

[1251] *Platform Order*, 13 FCC Rcd at 21353, para. 72.

[1252] *Id.* at 21355, para. 76. SONET stands for Synchronous Optical Network, and generally refers to fiber optic transmission facilities that operate at bit rates from 51.84 mbps to 39.812 gbps. *See* NEWTON'S TELECOM DICTIONARY 684-685 (18th ed. 2002).

[1253] *Platform Order*, 13 FCC Rcd at 21355-57, paras. 77-80.

[1254] *Id.* at 21354-57, paras. 75-80; *see also Inputs Order*, 14 FCC Rcd at 20291-92, para. 321 ("In the *Platform Order*, we concluded that the federal mechanism should incorporate, with certain modifications, the HAI 5.0a switching and interoffice facilities module.").

[1255] *See* Verizon Ex. 107, at 212-21; Verizon Ex. 100P, Parts C-9 (common transport) and D-2 (dedicated transport) (confidential version).

[1256] Verizon Ex. 107, at 214-218; *see* Verizon Initial Cost Brief at 117-18.

[1257] Verizon Ex. 107, at 40-47, 216-18. Verizon uses its VCost system to apply the transport EF&I factor. Verizon Ex. 100, Vol. VII, Part D-2, section 1 (Study Overview), subsection 1.3 (Cost Study Methodology) at 1.

is then used to obtain per unit investments.[1258] The Verizon study subsequently populates circuit designs within the Verizon network and weights these designs by frequency of use to determine an average dedicated transport investment at the DS-0 level. Verizon determines higher levels of investments on a DS-0 equivalent basis.[1259] Finally, Verizon applies ACFs to each investment account.[1260]

498.   Verizon generates the fixed per MOU common transport rates and the per mile common transport rates in the same manner that it generates dedicated transport rates. Indeed, Verizon imports the final DS-1 dedicated transport costs into its common transport study.[1261] The Verizon common transport study also imports trunk costs from the SCIS cost model.[1262] Verizon then derives the common transport MOU rates from the imported monthly costs by dividing these costs by the per trunk average number of MOUs.[1263] Concurrent with the filing of its revised switching cost study and its November 1, 2001 revised UNE rate proposal, Verizon submitted corrections to certain algorithms in its common transport study.[1264] These corrections caused its proposed per mile common transport rate to double.[1265]

499.   AT&T/WorldCom criticize Verizon's common transport cost study as improperly based on the costs of Verizon's embedded SONET ring architecture, with forward-looking adjustments applied to this embedded base.[1266] AT&T/WorldCom argue, therefore, that Verizon does not attempt to model a forward-looking network design as required by TELRIC principles.[1267] AT&T/WorldCom allege, moreover, that Verizon's forward-looking adjustments are merely unsubstantiated opinions of its subject matter experts.[1268]

[1258] *Id.* at 41, 216-17. VRUC is a cable investment inventory containing data from actual property cost records on the cost and amount of outside plant units deployed. The data are maintained on an annual basis. *Id.* at 120. EF&I factors are applied to the materials-only equipment prices. *Id.* at 121. For interoffice transport, the VRUC database contains total installed investments for fiber cable, including engineering and installation costs. *Id.* at 41, 216-17.

[1259] *Id.* at 218.

[1260] *Id.*; Verizon Initial Cost Brief at 118; *see supra* section III(E) for a discussion of ACFs.

[1261] Verizon Ex. 100P, Vol. VI, Part C-9 (Common Transport), sections 1.2 (Cost Study Methodology) and 3 (Inputs) (confidential version); *see also* AT&T/WorldCom Initial Cost Brief at 195.

[1262] Verizon Ex. 100P, Vol. VI, Part C-9 (Common Transport), section 3 (Inputs) (confidential version).

[1263] Verizon Ex. 107, at 219.

[1264] *See* Verizon Ex. 180; Tr. at 5594-95 (admitting same into evidence).

[1265] *See* Tr. 5637-38.

[1266] AT&T/WorldCom Initial Cost Brief at 193.

[1267] *Id.*

[1268] *Id.* (citing Tr. at 5628).

500. AT&T/WorldCom affirmatively propose using the MSM to generate TELRIC-compliant rates for common transport only.[1269] The MSM contains a switching and interoffice transport module.[1270] This module, like the Verizon cost study, assumes the use of SONET ring technology and network architecture.[1271] It models a network of two classes of rings: host/remote and tandem/host/standalone.[1272] As inputs, the module uses the total line count for every wire center; the distance between switches; peak traffic assumptions; and the distribution of local intraoffice, local interoffice, intraLATA toll, interexchange access, and operator services traffic.[1273] Calling minutes and volumes data inputs are derived from ARMIS data.[1274] The PNR database is used to provide line counts for the serving areas (each associated with a particular wire center), as well as wire center locations and interoffice distances.[1275] The module determines the traffic per subscriber based on the traffic assumptions and calculates the number of trunks necessary to carry this volume of traffic.[1276] Finally, the module uses an optimizing algorithm to ensure the modeling of the efficient construction of SONET rings.[1277]

501. To generate rates for dedicated transport, AT&T/WorldCom propose starting with the Verizon cost study,[1278] but correcting certain cost inputs, which will thereby enable the

---

[1269] *See* Tr. at 5551, 5559-62, 5599; AT&T/WorldCom Initial Cost Brief at 188-89; *see also* AT&T/WorldCom Ex. 7, at 3; Verizon Initial Cost Brief at 173.

[1270] *See* AT&T/WorldCom Ex. 14, Attach. A; AT&T/WorldCom Ex. 23, HAI Model Release 5.0a at 53-63 ("Switching/Transport module"); AT&T/WorldCom Initial Cost Brief at 188. Although AT&T/WorldCom filed an updated version of their common transport study later in the proceeding, *see* Keffer Dec. 12 Letter, Install A, the general model descriptions provided in the initial cost model filing remain the same.

[1271] AT&T/WorldCom Ex. 23, Switching/Transport module at 59.

[1272] *Id.*

[1273] *Id.* at 54; *see* AT&T/WorldCom Initial Cost Brief at 193.

[1274] AT&T/WorldCom Ex. 23, Switching/Transport module at 54.

[1275] *Id.* PNR Associates, the supplier of the PNR database, is now TNS Telecoms. *See* TNS Telecoms, *Notification Page* (visited Mar. 5, 2003) < http://www.indetec.com>. In the *Inputs Order*, the Commission adopted PNR's road surrogating algorithm to develop customer number and location data. *Inputs Order*, 14 FCC Rcd at 20176-20817, paras. 40-62.

[1276] AT&T/WorldCom Ex. 23, Switching/Transport module at 59.

[1277] *Id.* at 60.

[1278] AT&T/WorldCom Initial Cost Brief at 188-89; *see also* Tr. at 5562-63, 5599. AT&T/WorldCom claim that the MSM does not model dedicated transport, entrance facilities, or dark fiber transport. Rather, the MSM generates only per minute costs per DS-0 equivalent for dedicated transport. *See* AT&T/WorldCom Initial Cost Brief at 188. AT&T/WorldCom concede that these costs are not readily translated into fixed monthly costs, as required by the Commission's rules. *Id.*; 47 C.F.R. § 51.509(c). Thus, AT&T/WorldCom do not propose using the MSM to generate rates for dedicated transport elements.

Verizon study to generate TELRIC-compliant dedicated transport rates.[1279] The specific flaws that AT&T/WorldCom claim require correction are discussed individually, below.[1280]

502. Verizon claims that the MSM transport module is fundamentally incapable of generating forward-looking UNE rates and that the flaws in the MSM are not subject to any cure short of rejecting the model outright.[1281] Verizon alleges that the AT&T/WorldCom module is flawed for the following reasons: (1) it assumes a network inconsistent with Verizon's actual network in Virginia;[1282] (2) it relies on incorrect demand data;[1283] (3) it underestimates trunk counts;[1284] (4) it improperly determines the busy hour;[1285] (5) it fails to include capitalized labor costs that are necessary to account for circuit design, central office translations, and pre-activation testing;[1286] (6) it understates OC-3 multiplexing investments;[1287] (7) it understates investments for remote switches;[1288] (8) it fails to include any investment for umbilical cable between host and remote switches;[1289] (9) it improperly drops two wire centers;[1290] (10) it fails to optimize inputs and outputs with the loop module;[1291] and (11) it uses improper SONET electronics prices.[1292]

[1279] AT&T/WorldCom Initial Cost Brief at 180; *see also* Tr. at 5559-63, 5599.

[1280] *See infra* sections VI(B)-(D); AT&T/WorldCom Ex. 12. at 127, 137-38; AT&T/WorldCom Initial Cost Brief at 189-92; AT&T/WorldCom Reply Cost Brief at 94-96.

[1281] Verizon Ex. 163, at 8-9, 21, 24; Verizon Ex. 108, at 53-54.

[1282] Verizon Ex. 163, at 9-10, 13; Verizon Ex. 108 at 53-54; Verizon Initial Cost Brief at 121.

[1283] Verizon Ex. 109, at 57, 60; *see* Verizon Ex. 108, at 54.

[1284] Verizon Ex. 109, at 57-60, 64-65.

[1285] *See id.* at 50-51, 53-55.

[1286] *Id.* at 59.

[1287] Verizon Ex. 162, at 12-15; *but see* Verizon Ex. 109, at 65, *as modified by* Verizon Ex. 171 (Updated Calculations (Switching and IOF) in the Rebuttal Testimony of Francis J. Murphy) at 2 (The MSM, "with the AT&T/WorldCom changes, no longer understates ADM and DCS investment."); *see also* Tr. at 5634-35.

[1288] Verizon Ex. 162, at 11-15; *see* Tr. at 5606-07.

[1289] Verizon Ex. 163, at 15-17.

[1290] *Id.* at 8, 20-21.

[1291] Verizon Ex. 162, at 9.

[1292] *Id.* at 10 (citing Letter from William Jordan, Vice President, Federal Regulatory, BellSouth, to Magalie Roman Salas, Secretary, Federal Communications Commission, CC Docket Nos. 96-45 and 97-160 (filed Aug. 7, 1998)).